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AUTHORITY

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January 1953

Progress Report

Contract Nonr-228(05)

In line with suggested changes by your Committee on Dentistry, the investigations have progressed using modified "synthetic" diets. The present emphasis is being placed on the histological effects of missing single amino acids on the long bones, the jaws, and the teeth of rats. A tryptophane deficient diet was therefore devised containing the following:

9% Mazola
15% Casein hydrolysate
4% salt mixture
2% Cod liver oil
4% Wheat germ oil
Corn starch q. ad 100 grams

The control animals were provided a diet in which the casein hydrolysate was supplemented with tryptophane. Both types of diets were adequately supplemented with a balanced mixture of synthetic vitamins.

The experimental groups were divided as follows:

Group I
Tryptophane deficient for three weeks and then repleted for four weeks.

Group II
Tryptophane deficient for seven weeks and then repleted.

Group III
Tryptophane adequate.

At the end of the three week depletion period the animals in Groups I and II averaged 40 grams in weight, while those in Group III averaged 120 grams. At this time (three weeks and again at seven weeks) the animals from both the deficient and control groups were sacrificed for histological studies.

In the experimental animals of Groups I and II the mandibular condyles showed a decrease in width of the cartilage which varied from a narrowing at three weeks to an extreme thinning at seven weeks. The myloid elements of the marrow spaces were replaced by fatty tissue. The interradicular and interseptal bone showed marked thinning of the trabeculations as the deficiency continued.

No changes in the molars and incisors were evident at the end of three weeks. However at the end of seven weeks there were marked changes in the incisors characterized by hypocalcification of the dentin as evidenced by the increased number of interglobular spaces.

Specially constructed orthodontic appliances were placed on the incisors of the animals of Group I after repletion as well as on some of the controls from group III. The idea being to see whether the history of a previous dietary deficiency has any effect on bone in its response to stress. These animals are now being sectioned but at the time of this writing have not been studied.

In the meantime another similar set of experiments have been set up using lysine as the missing factor. The basal diet for these experiments is as follows:

	Diet A	Diet B
Zein	19.2	18.
L - Arginine	1.	1.
L - Tryptophane	0.25	0.25
L - Histidine	0.5	0.5
L - Lysine	0.	1.2
L - Cystine	0.25	0.25
DL - Methionine	0.6	0.6
DL - Threonine	1.2	1.2
DL - Phenylalanine	0.7	0.7
DL - Valine	1.6	1.6
Basal diet ad	100.	100.

The results of the tryptophane experiment will be presented at the annual meeting of the International Association of Dental Research in March 1953 and a manuscript is being prepared to be submitted to the Journal of Dental Research as soon as possible.

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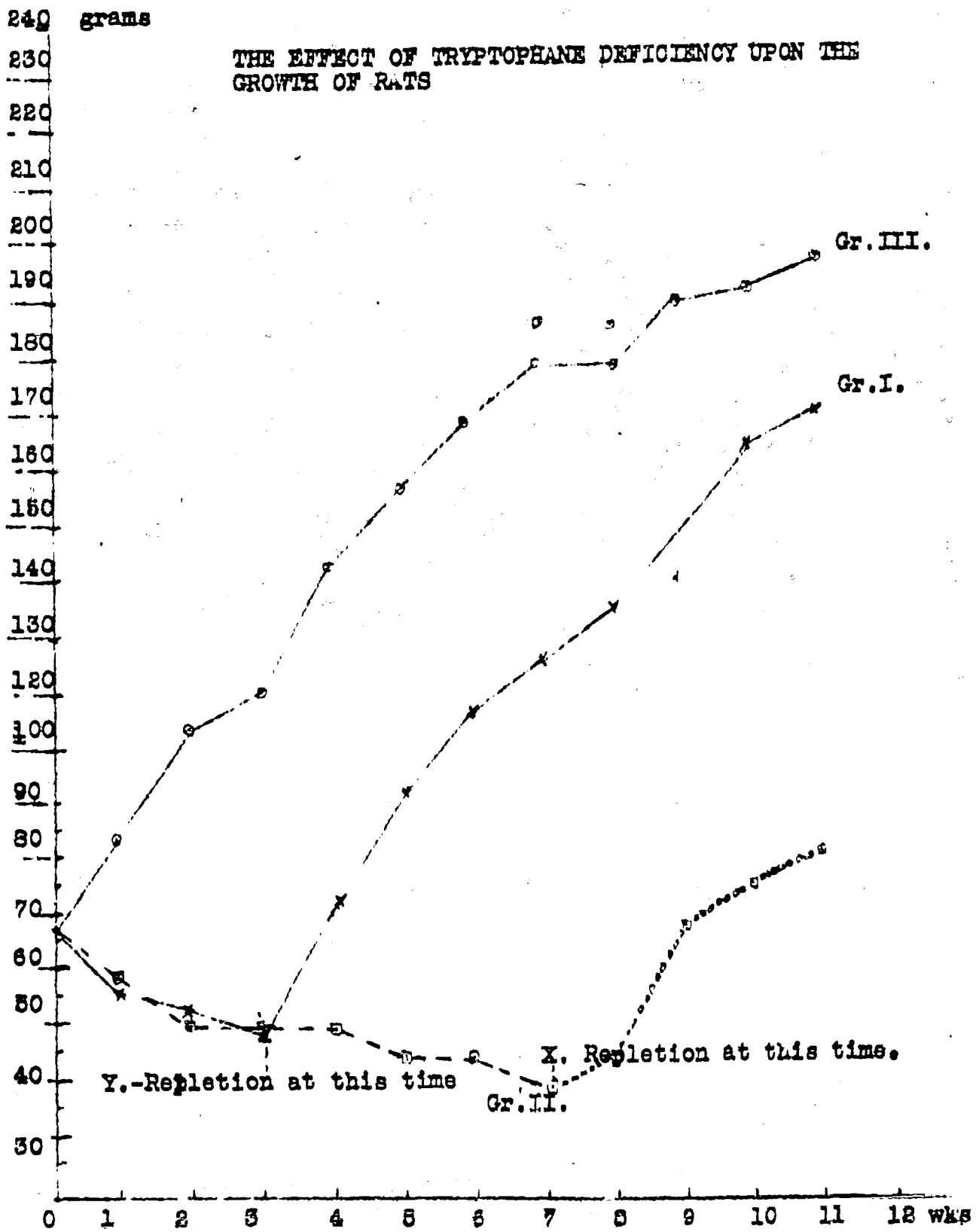
grams
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THE EFFECT OF TRYPTOPHANE DEFICIENCY UPON THE GROWTH OF RATS
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Gr.I.
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X. Repletion at this time.
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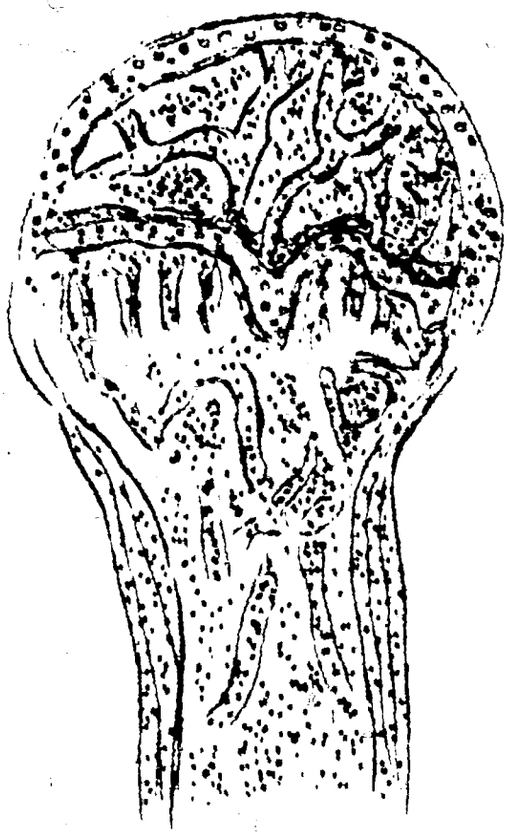

Fig.1. Control animal. Lower power view of the head of femur showing epiphyseal plate part of diaphysis.

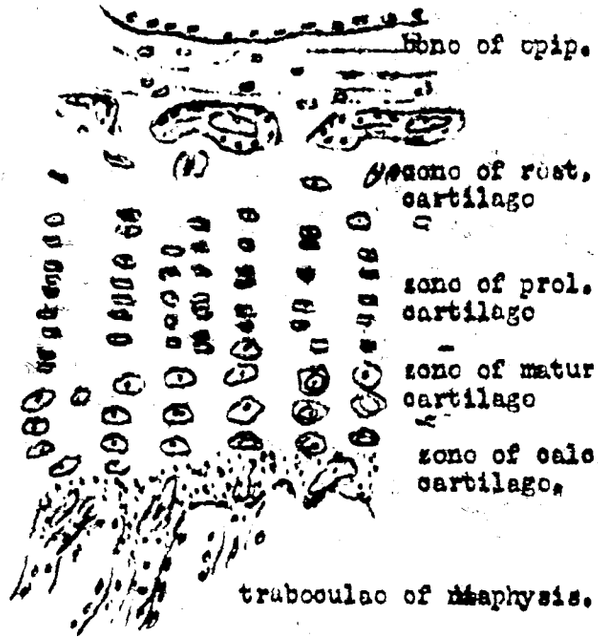

Fig.2, Higher power of Fig.1, Note the different zones of cartilage and bone.

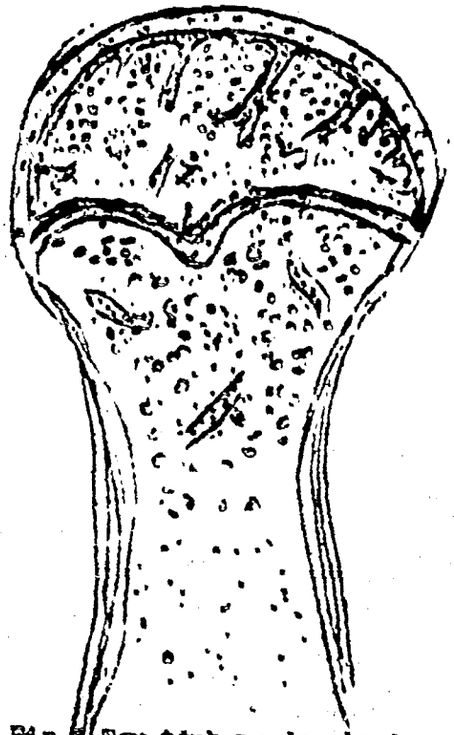

Fig.3. Tryptophane deprived group. Low power showing osteoporisis and prominence of fat in marrow.

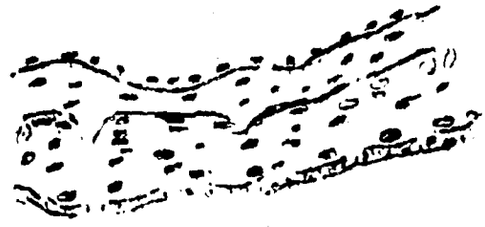

Fig.4. High power of fig.3. Note the lack of zones of matruing cartilage, and absence of ossification.

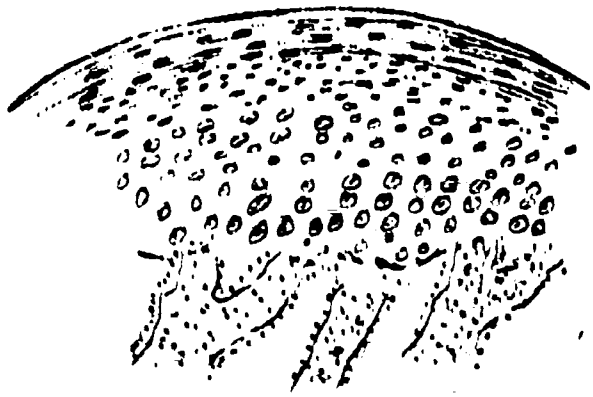

Fig.5. Condyle of control animal. Note the proliferation of the cartilage and bone spicules.

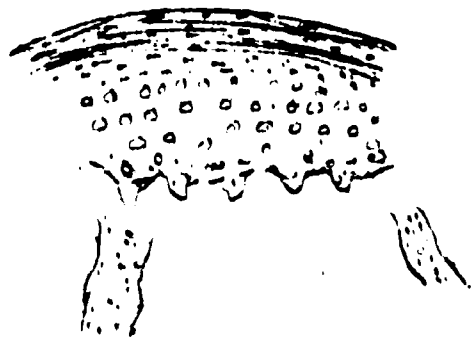

Fig.6. Condyle of experimental animals. Note the atrophy of the condyle with decreased activity of the cartilage and bone.

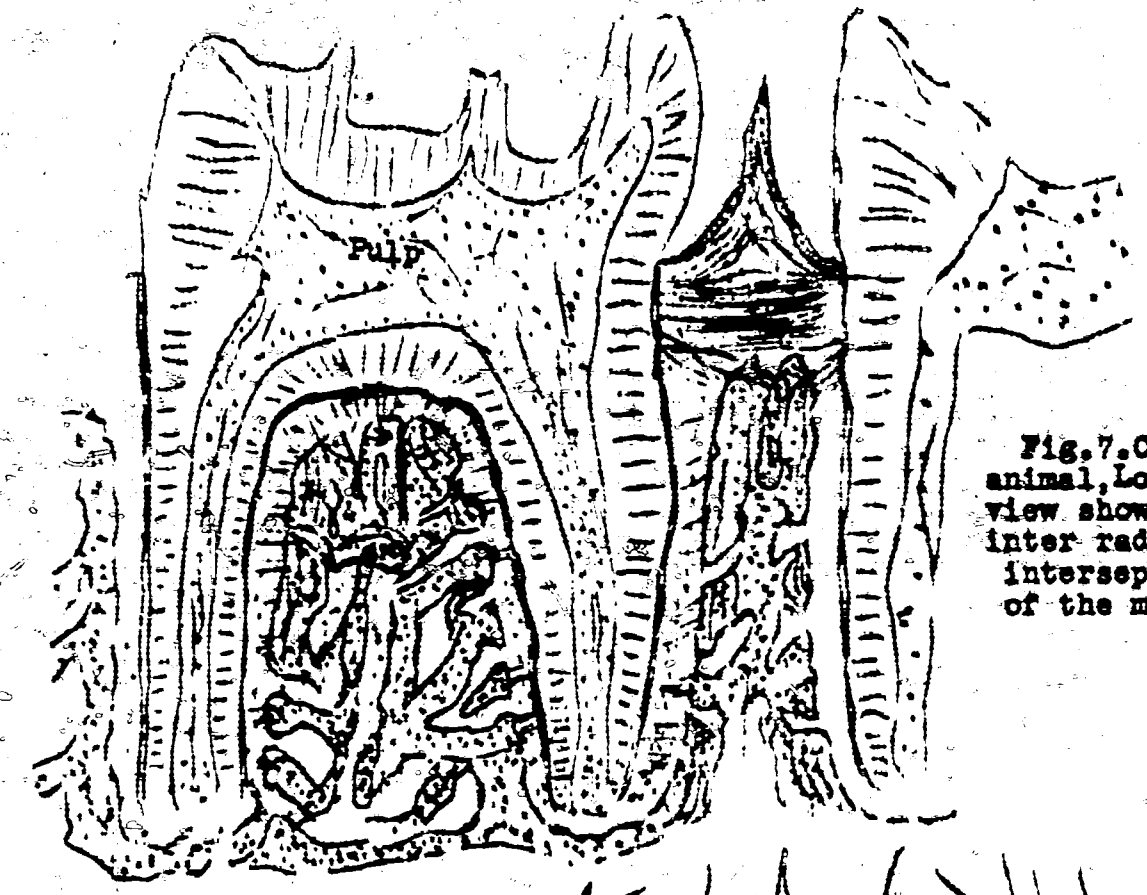

Fig.7.Control animal,Low power view showing inte inter radicular& interseptal area of the molar.

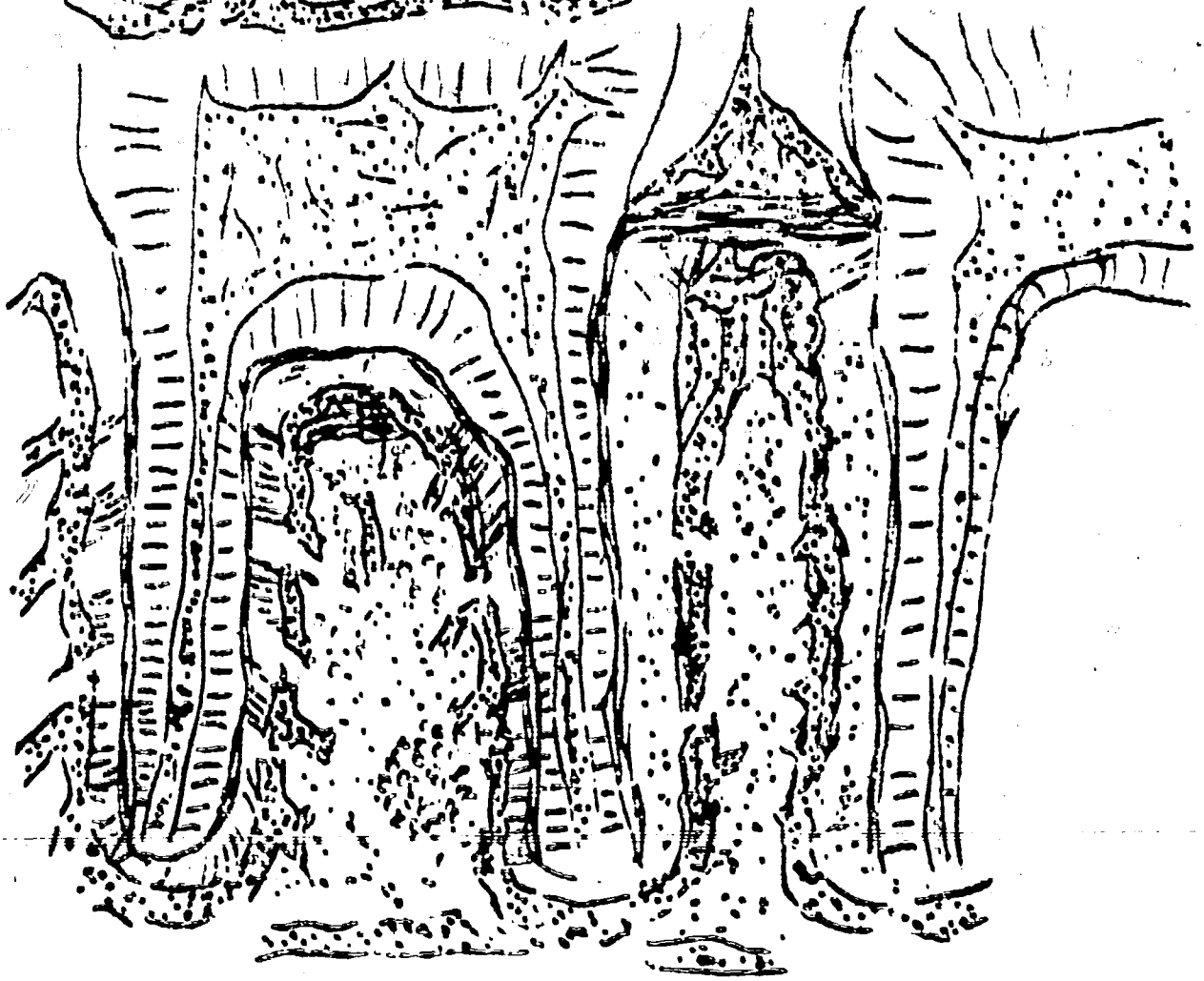

Fig. 8. Low power of experimental animal showing the changes to the interradicular and interseptal areas in which there occurs osteoporosis of the areas with disorganization of the periodontal membrane fibers in the interradicular space.

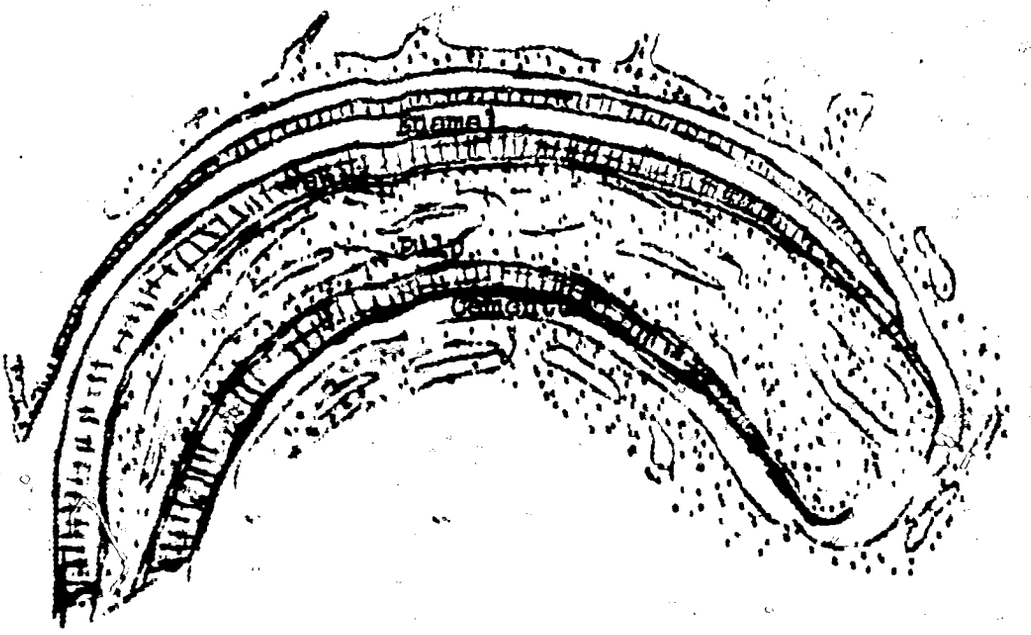

Fig.9. Incisor of control animal. The dentine appears homogenous in structure and stains evenly.

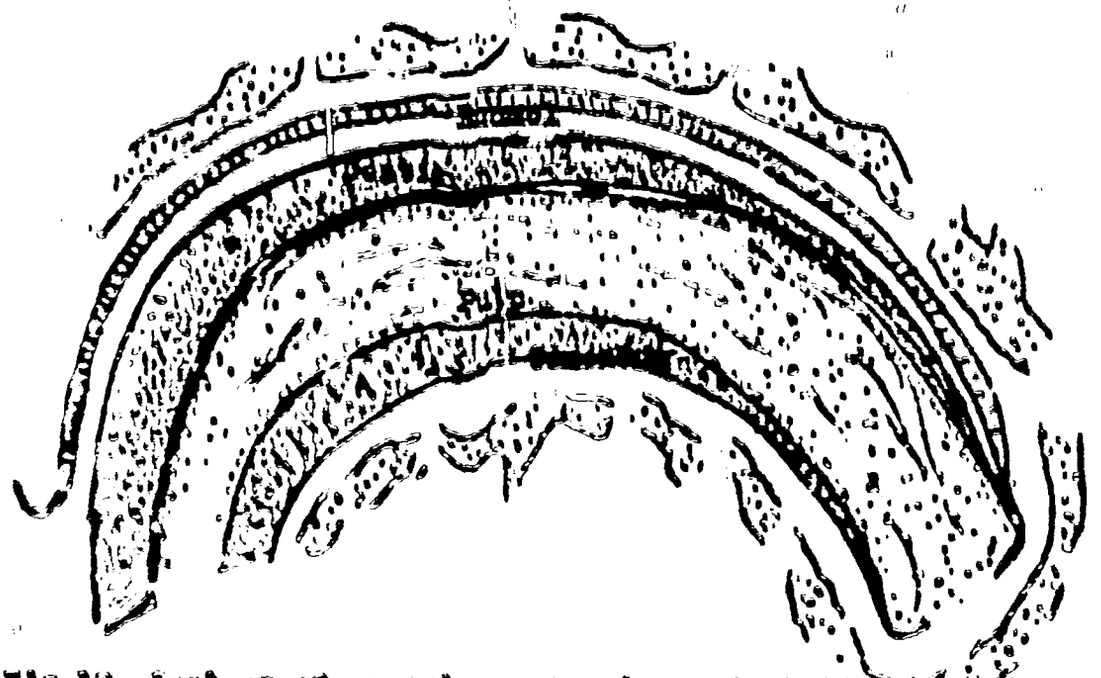

Fig.10. Incisor of experimental animal, deficient diet 7 weeks. Note the hypocalcification in the dentin characterized by the dots.